US 20200273146A1

(19) **United States**

(12) **Patent Application Publication**

BURGOYNE et al.

(10) **Pub. No.: US 2020/0273146 A1**

(43) **Pub. Date: Aug. 27, 2020**

(54) **MOVEMENT WITHIN AN ENVIRONMENT**

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(21) Appl. No.: **16/796,747**

(22) Filed: **Feb. 20, 2020**

Related U.S. Application Data

(60) Provisional application No. 62/809,362, filed on Feb. 22, 2019.

Publication Classification

(51) **Int. Cl.**

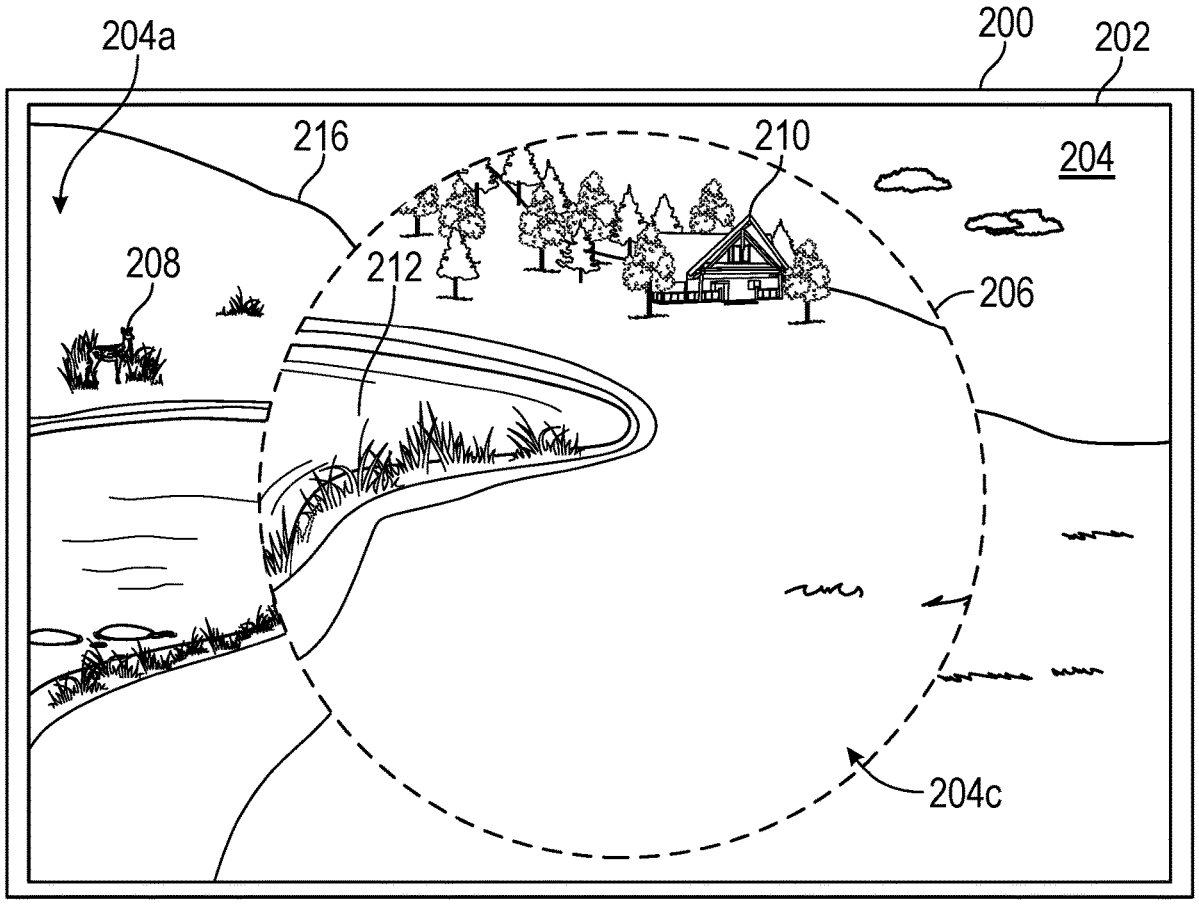
G06T 3/40	(2006.01)
G06T 19/00	(2006.01)
G06K 9/00	(2006.01)

(52) **U.S. Cl.**

CPC ***G06T 3/40*** (2013.01); ***G06K 9/00671*** (2013.01); ***G06T 19/006*** (2013.01)

(57) **ABSTRACT**

A magnified portion and an unmagnified portion of a computer-generated reality (CGR) environment are displayed from a first position. In response to receiving an input, a magnified portion of the CGR environment from a second position is displayed with a magnification less than that of the magnified portion of the CGR environment from the first position and a field of view greater than that of the magnified portion of the CGR environment from the first position. A first unmagnified portion of the CGR environment from a third position is displayed with a field of view greater than that of the magnified portion of the CGR environment from the second position. Then, a second unmagnified portion of the CGR environment from the third position is displayed with a field of view greater than that of the first unmagnified portion of the CGR environment from the third position.



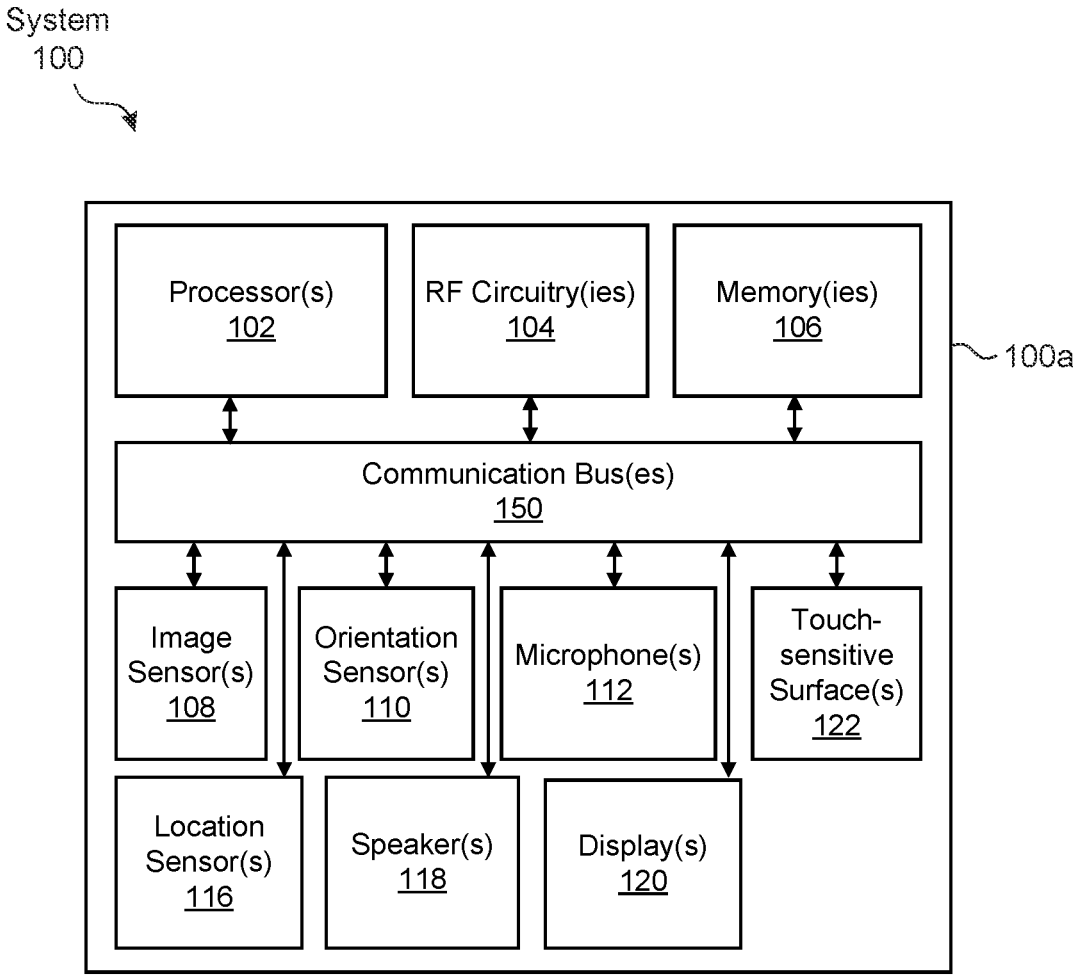
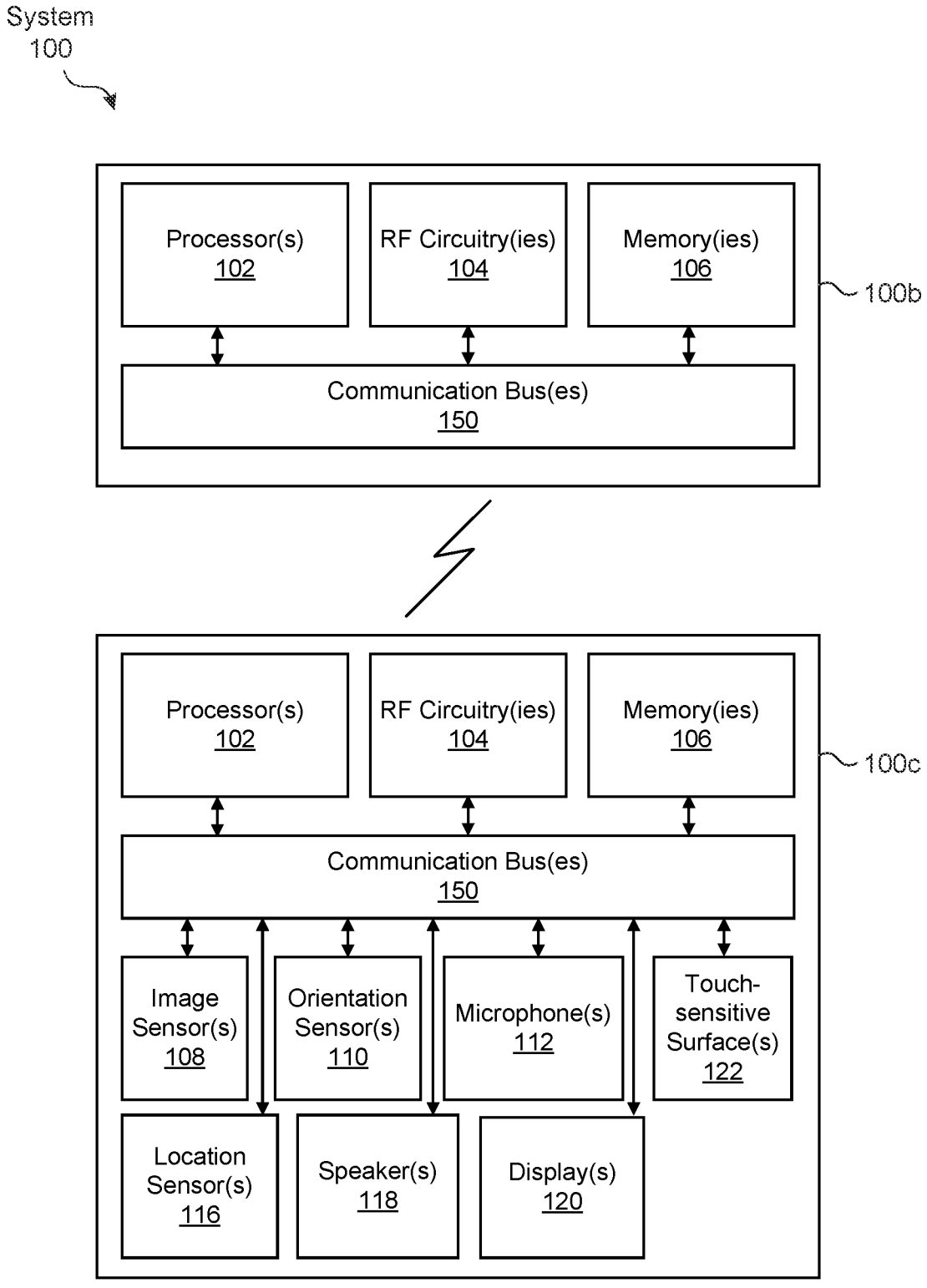

System
100
Processor(s)
102
RF Circuitry(ies)
104
Memory(ies)
106
100a
Communication Bus(es)
150
Image
Sensor(s)
108
Orientation
Sensor(s)
110
Microphone(s)
112
Touch-
sensitive
Surface(s)
122
Location
Sensor(s)
116
Speaker(s)
118
Display(s)
120

FIG. 1A


System
100
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102
RF Circuitry(ies)
104
Memory(ies)
106
100b
Communication Bus(es)
150
Processor(s)
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104
Memory(ies)
106
100c
Communication Bus(es)
150
Image
Sensor(s)
108
Orientation
Sensor(s)
110
Microphone(s)
112
Touch-
sensitive
Surface(s)
122
Location
Sensor(s)
116
Speaker(s)
118
Display(s)
120

FIG. 1B

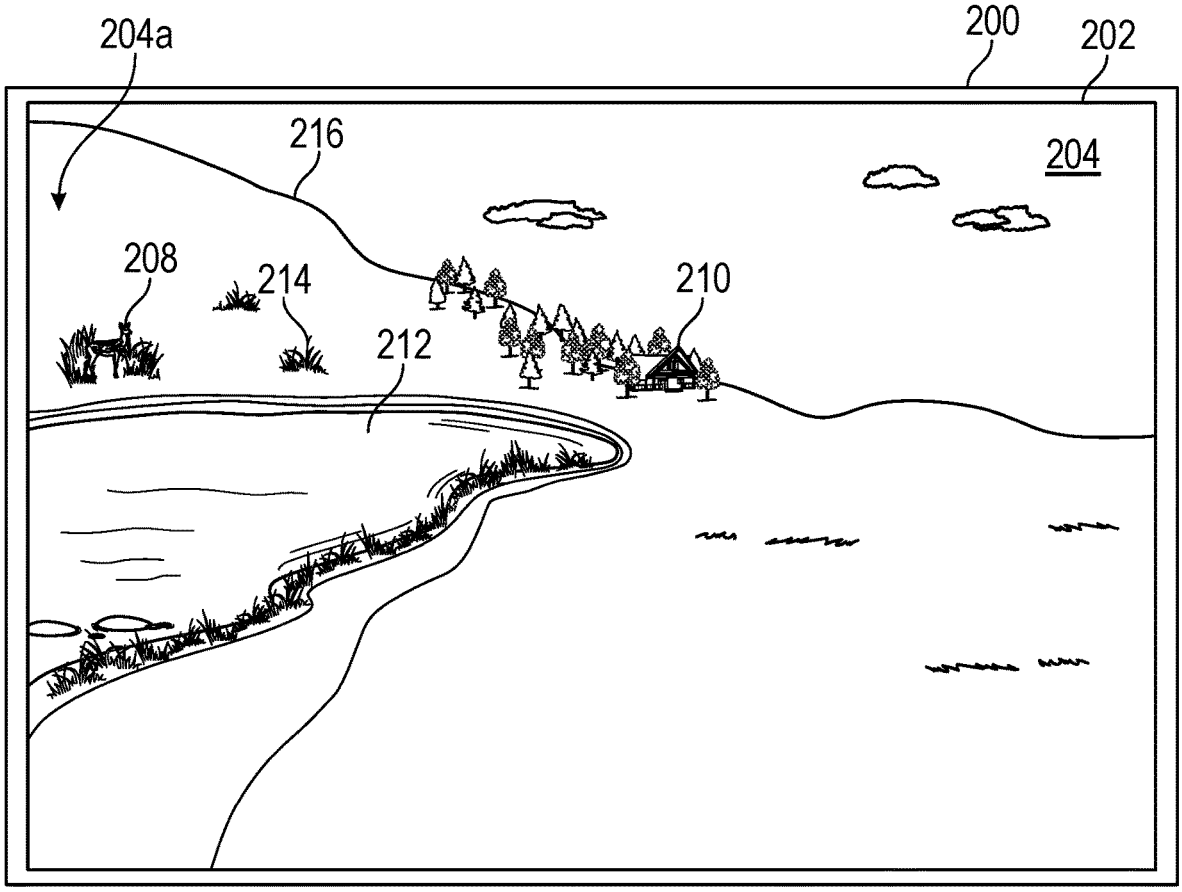

FIG. 2A

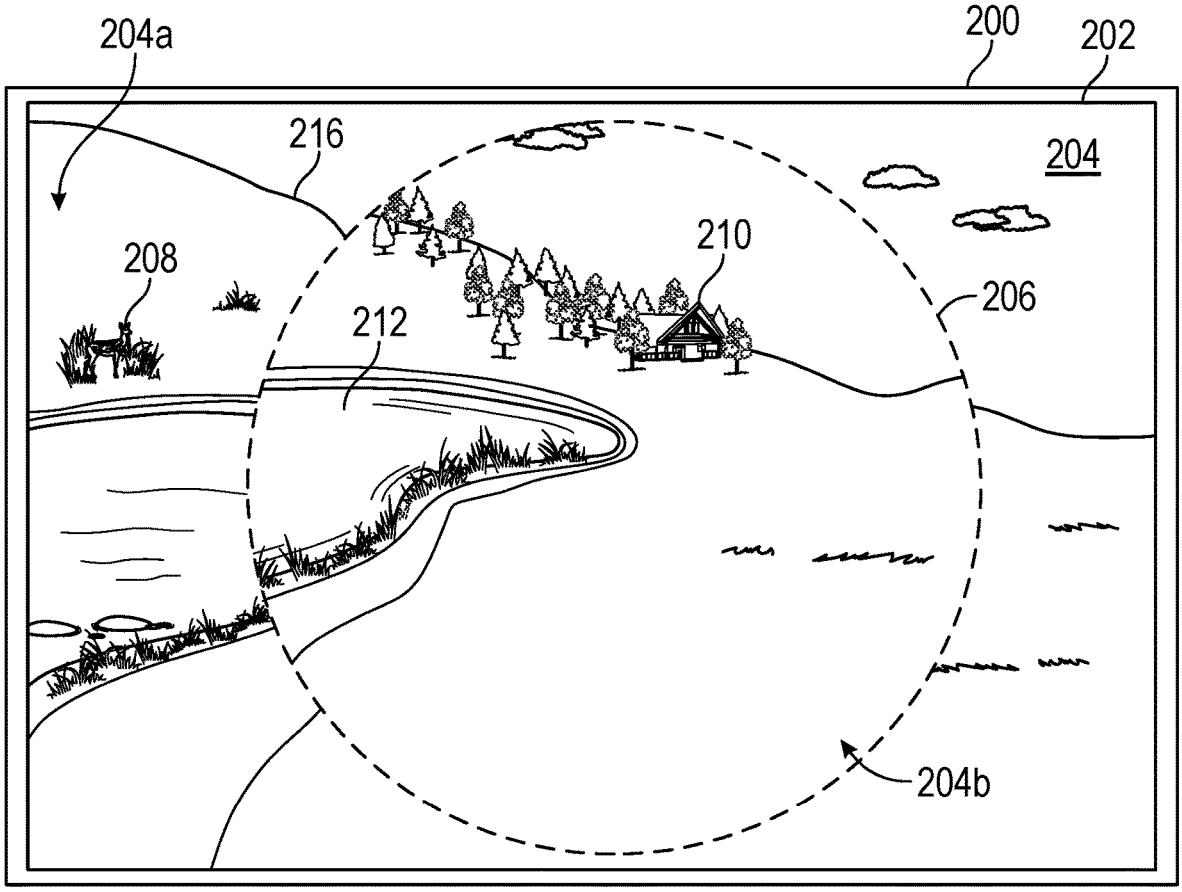

FIG. 2B

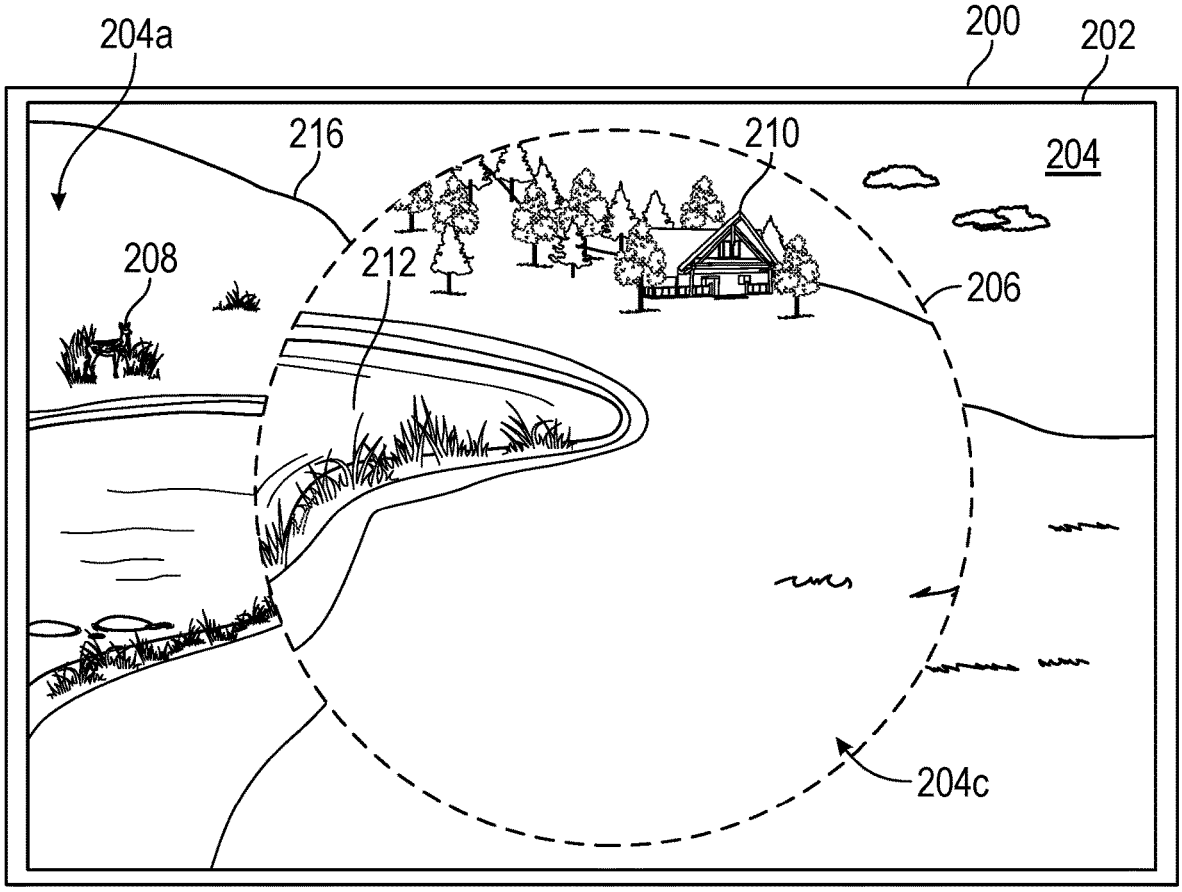

FIG. 2C

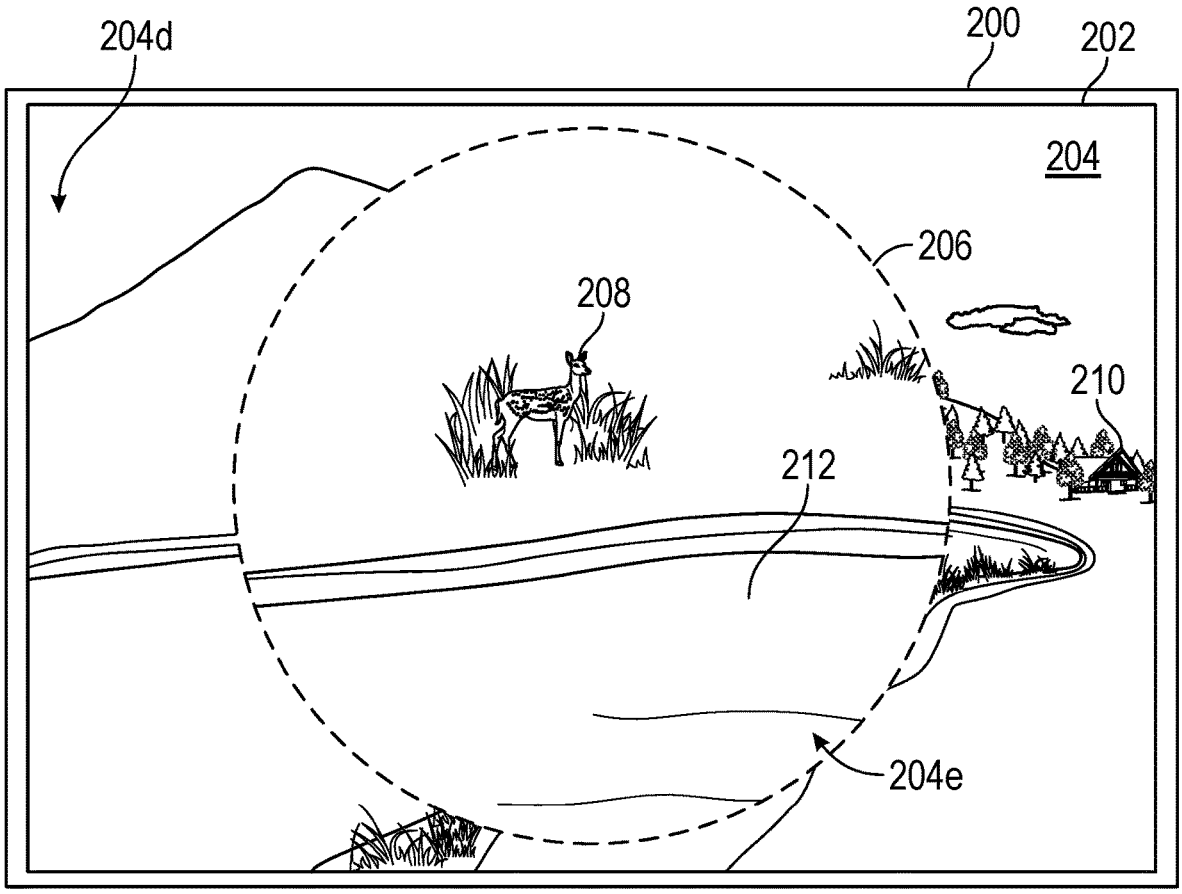

FIG. 2D

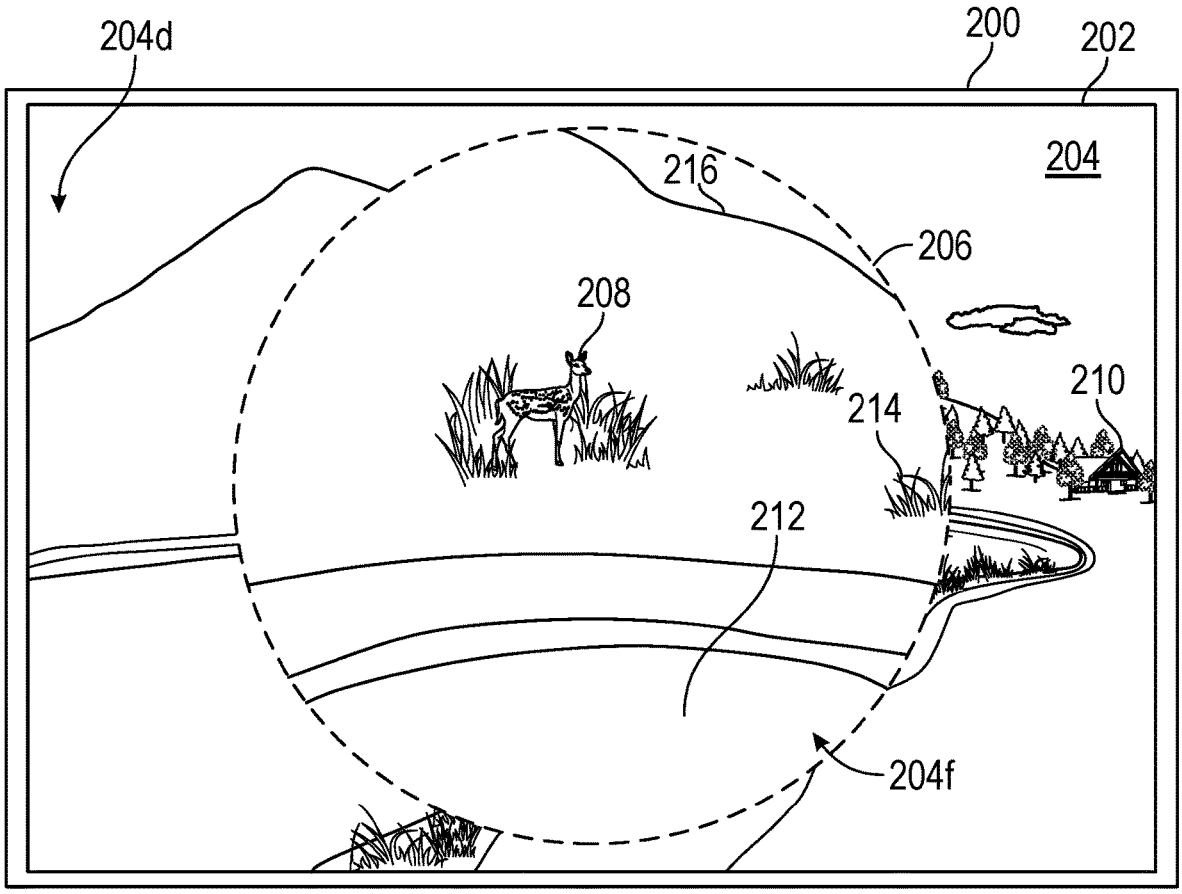

FIG. 2E

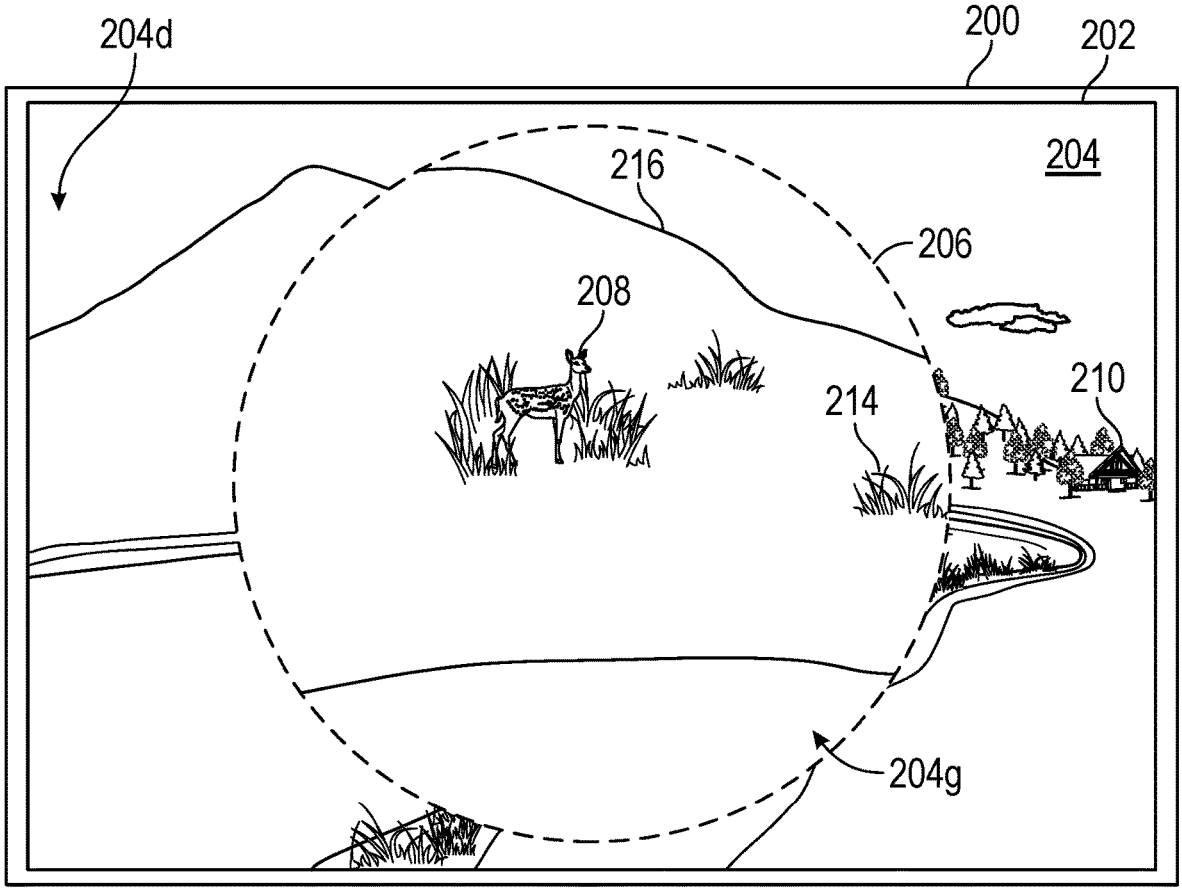

FIG. 2F

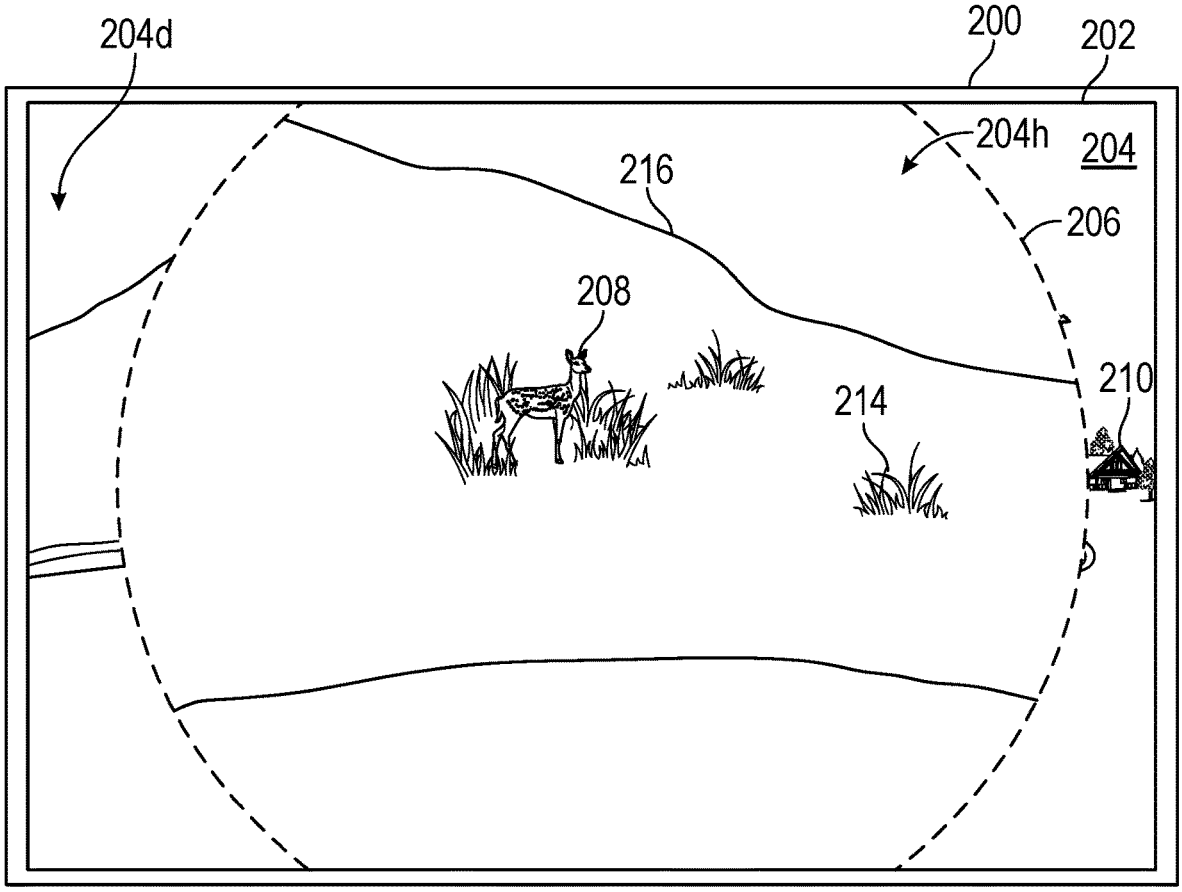

FIG. 2G

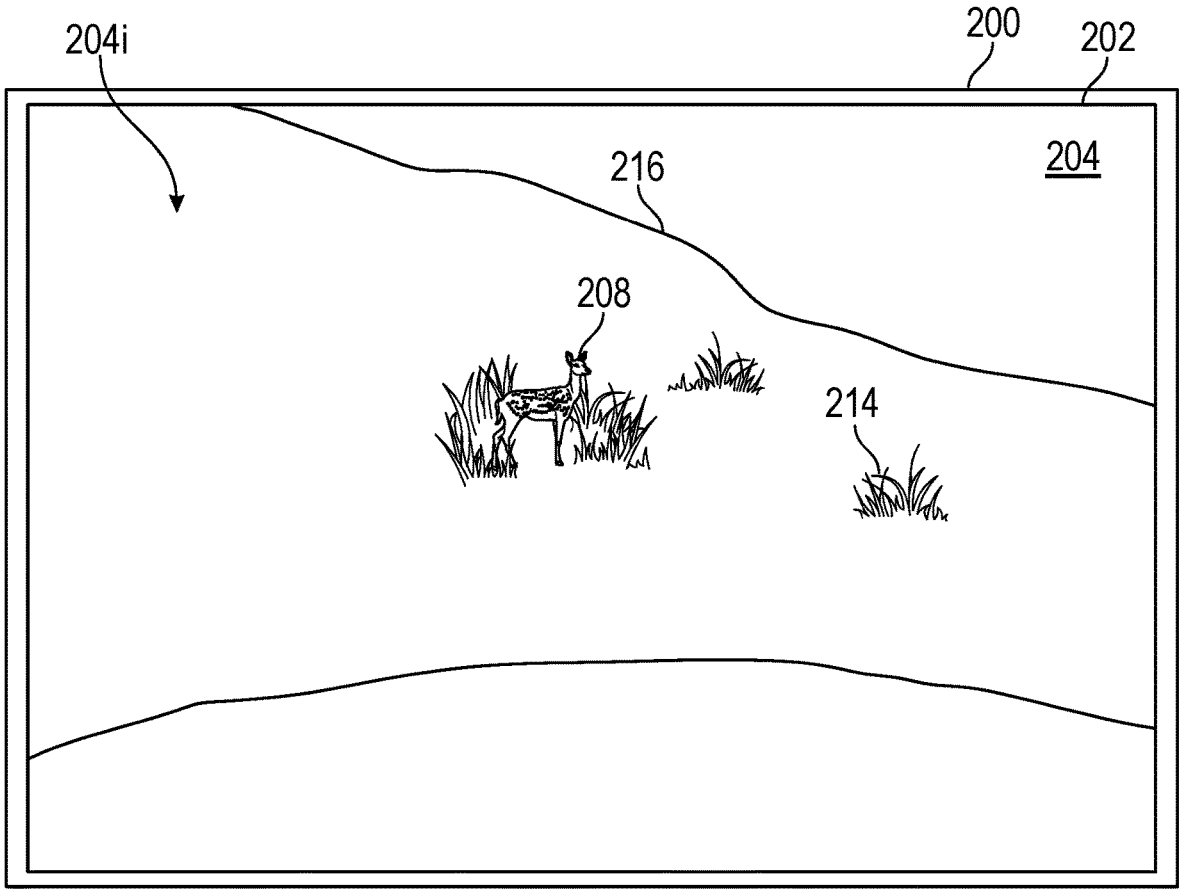

FIG. 2H

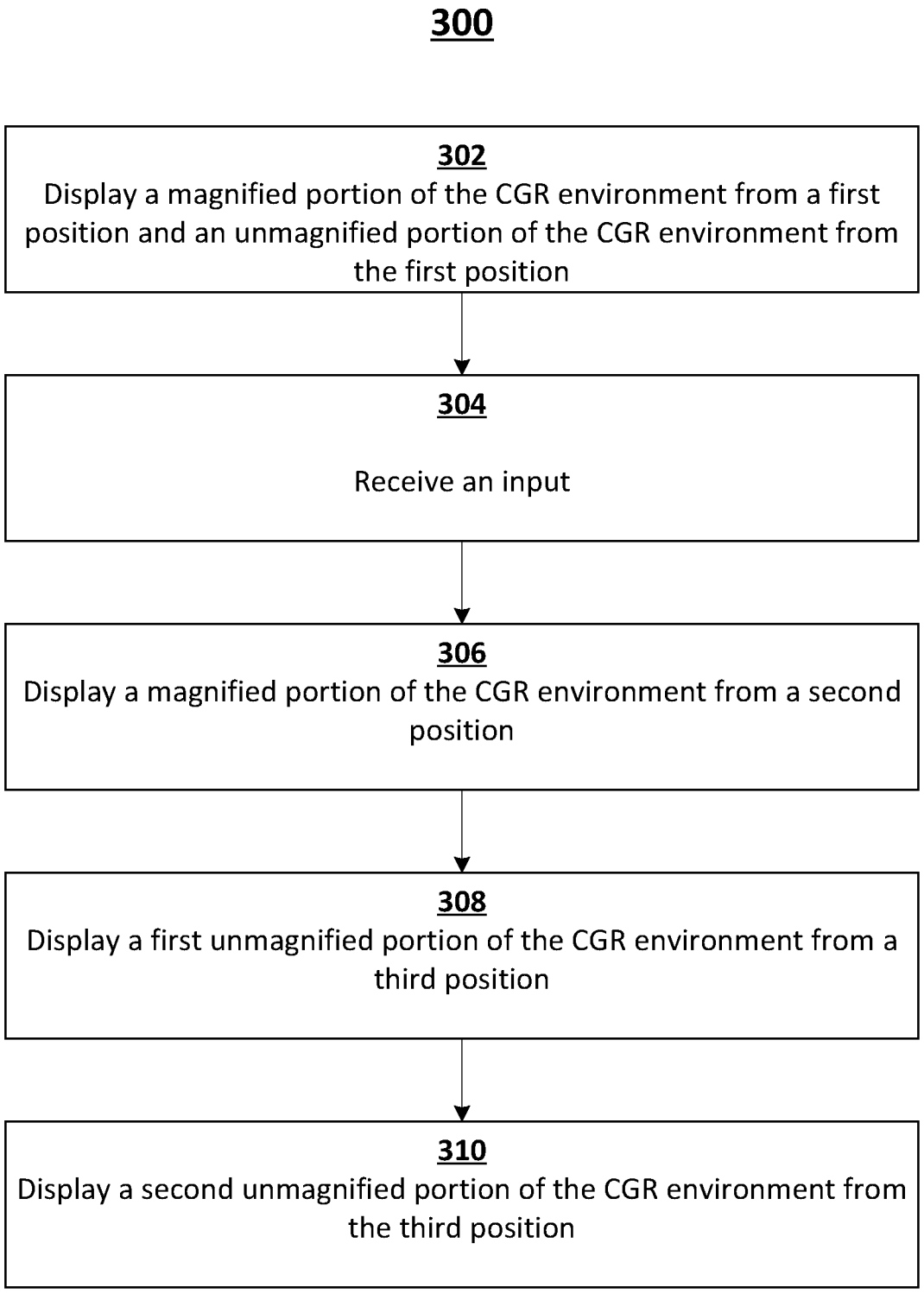
300
302
Display a magnified portion of the CGR environment from a first position and an unmagnified portion of the CGR environment from the first position
304
Receive an input
306
Display a magnified portion of the CGR environment from a second position
308
Display a first unmagnified portion of the CGR environment from a third position
310
Display a second unmagnified portion of the CGR environment from the third position

FIG. 3

MOVEMENT WITHIN AN ENVIRONMENT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims priority to U.S. Provisional Patent Application Ser. No. 62/809,362, titled "LOCOMOTION IN A COMPUTER-GENERATED REALITY ENVIRONMENT," filed on Feb. 22, 2019, the content of which is hereby incorporated by reference in its entirety.

BACKGROUND

1. Field

[0002] The present disclosure relates generally to computer-generated reality (CGR), and more specifically to techniques for moving in a CGR environment.

2. Related Art

[0003] Some CGR applications display the CGR environment from a particular position in the CGR environment. In some cases, the position represents the location of a user or a virtual camera within the CGR environment. In some applications, a user may desire to move within the CGR environment and/or view the CGR environment from a different position. Movement in a CGR environment need not correspond directly to the actual physical movement of the user in the real world. Indeed, a user can move great distances quickly in a CGR environment that would be infeasible in the real world. Perceptive users may recognize non-linearity between movement in CGR relative to movement in the real world.

BRIEF SUMMARY

[0004] The present disclosure describes techniques for changing the position from which a CGR environment is displayed. In embodiments in which the position represents the position of a user within the CGR environment, changing the position allows a user to move within the CGR environment. The techniques described below allow a user to smoothly transition from one location to another within a CGR environment while maintaining context (e.g., of where the user moved to relative to where the user was previously).

[0005] In some embodiments, a method for moving about a CGR environment includes displaying a magnified portion of the CGR environment from a first position and an unmagnified portion of the CGR environment from the first position. An input is received, and in response to receiving the input: a magnified portion of the CGR environment from a second position is displayed, a first unmagnified portion of the CGR environment from a third position is displayed, and, after displaying the first unmagnified portion of the CGR environment from the third position, a second unmagnified portion of the CGR environment from the third position is displayed. The magnified portion of the CGR environment from the second position has a magnification less than a magnification of the magnified portion of the CGR environment from the first position. The magnified portion of the CGR environment from the second position has a field of view greater than a field of view of the magnified portion of the CGR environment from the first position. The first unmagnified portion of the CGR environment from the third position has a field of view greater than the field of view of the magnified portion of the CGR environment from the second position. The second unmagnified portion of the CGR environment from the third position has a field of view greater than the field of view of the first unmagnified portion of the CGR environment from the third position.

[0006] In some embodiments, a transitory or non-transitory computer-readable storage medium stores one or more programs configured to be executed by one or more processors of an electronic device. The one or more programs include instructions for displaying a magnified portion of a CGR environment from a first position and an unmagnified portion of the CGR environment from the first position. The one or more programs further include instructions for receiving an input and, in response to receiving the input: displaying a magnified portion of the CGR environment from a second position, displaying a first unmagnified portion of the CGR environment from a third position, and, after displaying the first unmagnified portion of the CGR environment from the third position, displaying a second unmagnified portion of the CGR environment from the third position. The magnified portion of the CGR environment from the second position has a magnification less than a magnification of the magnified portion of the CGR environment from the first position. The magnified portion of the CGR environment from the second position has a field of view greater than a field of view of the magnified portion of the CGR environment from the first position. The first unmagnified portion of the CGR environment from the third position has a field of view greater than the field of view of the magnified portion of the CGR environment from the second position. The second unmagnified portion of the CGR environment from the third position having a field of view greater than the field of view of the first unmagnified portion of the CGR environment from the third position.

[0007] In some embodiments, an electronic device includes one or more processors and memory storing one or more programs configured to be executed by the one or more processors. The one or more programs include instructions for displaying a magnified portion of a CGR environment from a first position and an unmagnified portion of the CGR environment from the first position. The one or more programs further include instructions for receiving an input and, in response to receiving the input: displaying a magnified portion of the CGR environment from a second position, displaying a first unmagnified portion of the CGR environment from a third position, and, after displaying the first unmagnified portion of the CGR environment from the third position, displaying a second unmagnified portion of the CGR environment from the third position. The magnified portion of the CGR environment from the second position has a magnification less than a magnification of the magnified portion of the CGR environment from the first position. The magnified portion of the CGR environment from the second position has a field of view greater than a field of view of the magnified portion of the CGR environment from the first position. The first unmagnified portion of the CGR environment from the third position has a field of view greater than the field of view of the magnified portion of the CGR environment from the second position. The second unmagnified portion of the CGR environment from the third position having a field of view greater than the field of view of the first unmagnified portion of the CGR environment from the third position.

[0008] In some embodiments, an electronic device includes means for displaying a magnified portion of a CGR environment from a first position and an unmagnified portion of the CGR environment from the first position, means for receiving an input, and means responsive to receiving the input for: displaying a magnified portion of the CGR environment from a second position, displaying a first unmagnified portion of the CGR environment from a third position, and, after displaying the first unmagnified portion of the CGR environment from the third position, displaying a second unmagnified portion of the CGR environment from the third position. The magnified portion of the CGR environment from the second position has a magnification less than a magnification of the magnified portion of the CGR environment from the first position. The magnified portion of the CGR environment from the second position has a field of view greater than a field of view of the magnified portion of the CGR environment from the first position. The first unmagnified portion of the CGR environment from the third position has a field of view greater than the field of view of the magnified portion of the CGR environment from the second position. The second unmagnified portion of the CGR environment from the third position having a field of view greater than the field of view of the first unmagnified portion of the CGR environment from the third position.

BRIEF DESCRIPTION OF DRAWINGS

[0009] FIGS. **1**A-**1**B depict exemplary systems for use in various computer-generated reality technologies.

[0010] FIGS. **2**A-**2**H illustrate techniques for moving in a CGR environment, according to various embodiments.

[0011] FIG. **3** depicts a flow chart of an exemplary process for moving in a CGR environment, according to various embodiments.

DETAILED DESCRIPTION

[0012] Various embodiments of electronic systems and techniques for using such systems in relation to various CGR technologies are described.

[0013] A physical environment (or real environment) refers to a physical world that people can sense and/or interact with without aid of electronic systems. Physical environments, such as a physical park, include physical articles (or physical objects or real objects), such as physical trees, physical buildings, and physical people. People can directly sense and/or interact with the physical environment, such as through sight, touch, hearing, taste, and smell.

[0014] In contrast, a CGR environment refers to a wholly or partially simulated environment that people sense and/or interact with via an electronic system. In CGR, a subset of a person's physical motions, or representations thereof, are tracked, and, in response, one or more characteristics of one or more virtual objects simulated in the CGR environment are adjusted in a manner that comports with at least one law of physics. For example, a CGR system may detect a person's head turning and, in response, adjust graphical content and an acoustic field presented to the person in a manner similar to how such views and sounds would change in a physical environment. In some situations (e.g., for accessibility reasons), adjustments to characteristic(s) of virtual object(s) in a CGR environment may be made in response to representations of physical motions (e.g., vocal commands).

[0015] A person may sense and/or interact with a CGR object using any one of their senses, including sight, sound, touch, taste, and smell. For example, a person may sense and/or interact with audio objects that create a 3D or spatial audio environment that provides the perception of point audio sources in 3D space. In another example, audio objects may enable audio transparency, which selectively incorporates ambient sounds from the physical environment with or without computer-generated audio. In some CGR environments, a person may sense and/or interact only with audio objects.

[0016] Examples of CGR include virtual reality and mixed reality.

[0017] A virtual reality (VR) environment (or virtual environment) refers to a simulated environment that is designed to be based entirely on computer-generated sensory inputs for one or more senses. A VR environment comprises a plurality of virtual objects with which a person may sense and/or interact. For example, computer-generated imagery of trees, buildings, and avatars representing people are examples of virtual objects. A person may sense and/or interact with virtual objects in the VR environment through a simulation of the person's presence within the computer-generated environment, and/or through a simulation of a subset of the person's physical movements within the computer-generated environment.

[0018] In contrast to a VR environment, which is designed to be based entirely on computer-generated sensory inputs, a mixed reality (MR) environment refers to a simulated environment that is designed to incorporate sensory inputs from the physical environment, or a representation thereof, in addition to including computer-generated sensory inputs (e.g., virtual objects). On a virtuality continuum, an MR environment is anywhere between, but not including, a wholly physical environment at one end and a VR environment at the other end.

[0019] In some MR environments, computer-generated sensory inputs may respond to changes in sensory inputs from the physical environment. Also, some electronic systems for presenting an MR environment may track location and/or orientation with respect to the physical environment to enable virtual objects to interact with real objects (that is, physical articles from the physical environment or representations thereof). For example, a system may account for movements so that a virtual tree appears stationary with respect to the physical ground.

[0020] Examples of MR include augmented reality and augmented virtuality.

[0021] An augmented reality (AR) environment refers to a simulated environment in which one or more virtual objects are superimposed over a physical environment, or a representation thereof. For example, an electronic system for presenting an AR environment may have a transparent or translucent display through which a person may directly view the physical environment. The system may be configured to present virtual objects on the transparent or translucent display, so that a person, using the system, perceives the virtual objects superimposed over the physical environment. Alternatively, a system may have an opaque display and one or more imaging sensors that capture images or video of the physical environment, which are representations of the physical environment. The system composites the images or video with virtual objects, and presents the composition on the opaque display. A person, using the

system, indirectly views the physical environment by way of the images or video of the physical environment, and perceives the virtual objects superimposed over the physical environment. As used herein, a video of the physical environment shown on an opaque display is called "pass-through video," meaning a system uses one or more image sensor(s) to capture images of the physical environment, and uses those images in presenting the AR environment on the opaque display. Further alternatively, a system may have a projection system that projects virtual objects into the physical environment, for example, as a hologram or on a physical surface, so that a person, using the system, perceives the virtual objects superimposed over the physical environment.

[0022] An AR environment also refers to a simulated environment in which a representation of a physical environment is transformed by computer-generated sensory information. For example, in providing pass-through video, a system may transform one or more sensor images to impose a select perspective (e.g., viewpoint) different than the perspective captured by the imaging sensors. As another example, a representation of a physical environment may be transformed by graphically modifying (e.g., enlarging) portions thereof, such that the modified portion may be representative but not photorealistic versions of the originally captured images. As a further example, a representation of a physical environment may be transformed by graphically eliminating or obfuscating portions thereof.

[0023] An augmented virtuality (AV) environment refers to a simulated environment in which a virtual or computer generated environment incorporates one or more sensory inputs from the physical environment. The sensory inputs may be representations of one or more characteristics of the physical environment. For example, an AV park may have virtual trees and virtual buildings, but people with faces photorealistically reproduced from images taken of physical people. As another example, a virtual object may adopt a shape or color of a physical article imaged by one or more imaging sensors. As a further example, a virtual object may adopt shadows consistent with the position of the sun in the physical environment.

[0024] There are many different types of electronic systems that enable a person to sense and/or interact with various CGR environments. Examples include head mounted systems, projection-based systems, heads-up displays (HUDs), vehicle windshields having integrated display capability, windows having integrated display capability, displays formed as lenses designed to be placed on a person's eyes (e.g., similar to contact lenses), headphones/earphones, speaker arrays, input systems (e.g., wearable or handheld controllers with or without haptic feedback), smartphones, tablets, and desktop/laptop computers. A head mounted system may have one or more speaker(s) and an integrated opaque display. Alternatively, a head mounted system may be configured to accept an external opaque display (e.g., a smartphone). The head mounted system may incorporate one or more imaging sensors to capture images or video of the physical environment, and/or one or more microphones to capture audio of the physical environment. Rather than an opaque display, a head mounted system may have a transparent or translucent display. The transparent or translucent display may have a medium through which light representative of images is directed to a person's eyes. The display may utilize digital light projection, OLEDs, LEDs, uLEDs, liquid crystal on silicon, laser scanning light source, or any combination of these technologies. The medium may be an optical waveguide, a hologram medium, an optical combiner, an optical reflector, or any combination thereof. In one embodiment, the transparent or translucent display may be configured to become opaque selectively. Projection-based systems may employ retinal projection technology that projects graphical images onto a person's retina. Projection systems also may be configured to project virtual objects into the physical environment, for example, as a hologram or on a physical surface.

[0025] FIG. **1**A and FIG. **1**B depict exemplary system **100** for use in various computer-generated reality technologies.

[0026] In some embodiments, as illustrated in FIG. **1**A, system **100** includes device **100***a*. Device **100***a* includes various components, such as processor(s) **102**, RF circuitry (ies) **104**, memory(ies) **106**, image sensor(s) **108**, orientation sensor(s) **110**, microphone(s) **112**, location sensor(s) **116**, speaker(s) **118**, display(s) **120**, and touch-sensitive surface (s) **122**. These components optionally communicate over communication bus(es) **150** of device **100***a*.

[0027] In some embodiments, elements of system **100** are implemented in a base station device (e.g., a computing device, such as a remote server, mobile device, or laptop) and other elements of the system **100** are implemented in a head-mounted display (HMD) device designed to be worn by the user, where the HMD device is in communication with the base station device. In some embodiments, device **100***a* is implemented in a base station device or a HMD device.

[0028] As illustrated in FIG. **1**B, in some embodiments, system **100** includes two (or more) devices in communication, such as through a wired connection or a wireless connection. First device **100***b* (e.g., a base station device) includes processor(s) **102**, RF circuitry(ies) **104**, and memory(ies) **106**. These components optionally communicate over communication bus(es) **150** of device **100***b*. Second device **100***c* (e.g., a head-mounted device) includes various components, such as processor(s) **102**, RF circuitry(ies) **104**, memory(ies) **106**, image sensor(s) **108**, orientation sensor(s) **110**, microphone(s) **112**, location sensor(s) **116**, speaker(s) **118**, display(s) **120**, and touch-sensitive surface(s) **122**. These components optionally communicate over communication bus(es) **150** of device **100***c*.

[0029] In some embodiments, system **100** is a mobile device. In some embodiments, system **100** is a head-mounted display (HMD) device. In some embodiments, system **100** is a wearable HUD device.

[0030] System **100** includes processor(s) **102** and memory (ies) **106**. Processor(s) **102** include one or more general processors, one or more graphics processors, and/or one or more digital signal processors. In some embodiments, memory(ies) **106** are one or more non-transitory computer-readable storage mediums (e.g., flash memory, random access memory) that store computer-readable instructions configured to be executed by processor(s) **102** to perform the techniques described below.

[0031] System **100** includes RF circuitry(ies) **104**. RF circuitry(ies) **104** optionally include circuitry for communicating with electronic devices, networks, such as the Internet, intranets, and/or a wireless network, such as cellular networks and wireless local area networks (LANs). RF circuitry(ies) **104** optionally includes circuitry for communicating using near-field communication and/or short-range communication, such as Bluetooth®.

[0032] System **100** includes display(s) **120**. In some embodiments, display(s) **120** include a first display (e.g., a left eye display panel) and a second display (e.g., a right eye display panel), each display for displaying images to a respective eye of the user. Corresponding images are simultaneously displayed on the first display and the second display. Optionally, the corresponding images include the same virtual objects and/or representations of the same physical objects from different viewpoints, resulting in a parallax effect that provides a user with the illusion of depth of the objects on the displays. In some embodiments, display(s) **120** include a single display. Corresponding images are simultaneously displayed on a first area and a second area of the single display for each eye of the user. Optionally, the corresponding images include the same virtual objects and/or representations of the same physical objects from different viewpoints, resulting in a parallax effect that provides a user with the illusion of depth of the objects on the single display.

[0033] In some embodiments, system **100** includes touch-sensitive surface(s) **122** for receiving user inputs, such as tap inputs and swipe inputs. In some embodiments, display(s) **120** and touch-sensitive surface(s) **122** form touch-sensitive display(s).

[0034] System **100** includes image sensor(s) **108**. Image sensors(s) **108** optionally include one or more visible light image sensor, such as charged coupled device (CCD) sensors, and/or complementary metal-oxide-semiconductor (CMOS) sensors operable to obtain images of physical objects from the real environment. Image sensor(s) also optionally include one or more infrared (IR) sensor(s), such as a passive IR sensor or an active IR sensor, for detecting infrared light from the real environment. For example, an active IR sensor includes an IR emitter, such as an IR dot emitter, for emitting infrared light into the real environment. Image sensor(s) **108** also optionally include one or more event camera(s) configured to capture movement of physical objects in the real environment. Image sensor(s) **108** also optionally include one or more depth sensor(s) configured to detect the distance of physical objects from system **100**. In some embodiments, system **100** uses CCD sensors, event cameras, and depth sensors in combination to detect the physical environment around system **100**. In some embodiments, image sensor(s) **108** include a first image sensor and a second image sensor. The first image sensor and the second image sensor are optionally configured to capture images of physical objects in the real environment from two distinct perspectives. In some embodiments, system **100** uses image sensor(s) **108** to receive user inputs, such as hand gestures. In some embodiments, system **100** uses image sensor(s) **108** to detect the position and orientation of system **100** and/or display(s) **120** in the real environment. For example, system **100** uses image sensor(s) **108** to track the position and orientation of display(s) **120** relative to one or more fixed objects in the real environment.

[0035] In some embodiments, system **100** includes microphones(s) **112**. System **100** uses microphone(s) **112** to detect sound from the user and/or the real environment of the user. In some embodiments, microphone(s) **112** includes an array of microphones (including a plurality of microphones) that optionally operate in tandem, such as to identify ambient noise or to locate the source of sound in space of the real environment.

[0036] System **100** includes orientation sensor(s) **110** for detecting orientation and/or movement of system **100** and/or display(s) **120**. For example, system **100** uses orientation sensor(s) **110** to track changes in the position and/or orientation of system **100** and/or display(s) **120**, such as with respect to physical objects in the real environment. Orientation sensor(s) **110** optionally include one or more gyroscopes and/or one or more accelerometers.

[0037] FIGS. **2**A-**2**H illustrate techniques for moving about a CGR environment. FIG. **2**A illustrates system **200**, which includes display **202**. In some embodiments, system **200** includes system **100**, device **100***a*, device **100***b*, and/or device **100***c*. In some embodiments, display **202** is or includes displays **120**, as described above. In FIG. **2**A, system **200** displays CGR environment **204** on display **202**.

[0038] As illustrated in FIG. **2**A, CGR environment **204** is a VR environment. However, the techniques described with respect to CGR environment **204** can also be applied to MR environments, including AR environments and AV environments. In some embodiments, CGR environment **204** is displayed by device **100***a*, where device **100***a* is a mobile device, such as a cellular phone, or an HMD device. In some embodiments in which CGR environment **204** is an MR environment, CGR environment **204** is displayed by device **100***a*, where device **100***a* provides pass through video or has a display that is at least partially transparent.

[0039] In FIG. **2**A, system **200** displays CGR environment **204** from a first position and (angular) orientation, and with a first field of view. In some embodiments, a position corresponds to a location within a CGR environment (e.g., a virtual location of a user). In the embodiment illustrated in FIG. **2**A, the first position corresponds to a location in CGR environment **204** that is next to pond **212** and the orientation is in the direction of cabin **210**. The field of view illustrated in FIG. **2**A includes an unmagnified portion **204***a* of CGR environment **204**.

[0040] While displaying unmagnified portion **204***a* illustrated in FIG. **2**A, system **200** receives a first input corresponding to a request to change a magnification of the display of CGR environment **204**. Changing the magnification can include increasing or decreasing the magnification (or magnification level) of the display of CGR environment or a portion thereof (e.g., by zooming in or zooming out, respectively, the display of CGR environment **204** or a portion thereof). In some embodiments, system **200** changes the magnification by adjusting the field of view (e.g., reducing the field of view increases magnification; increasing the field of view decreases magnification). For instance, the change in field of view can be computed as if the field of view would cover the entire display **202** (e.g., the computation of the field of view does not take into account the restriction of displaying a magnified portion only within a region of display **202**, such as region **206** as discussed below). In some embodiments, displaying a magnified portion only within a region of display **202** reduces the effective field of view, but is not part of the calculation that determines the display of a magnified portion.

[0041] In some embodiments, the first input is an input received at an input device coupled to system **200** (e.g., a touch-sensitive surface (e.g., **122**), keyboard, mouse, joystick, scroll wheel, handheld controller (e.g., with directional arrows and/or buttons), microphone(s) (e.g., **112**), image sensor(s) (e.g., **108**), orientation sensor(s) (e.g., **110**), or the like). In some embodiments, the first input is a manual

input (e.g., a button press, touch gesture on a touch-sensitive surface, rotation of a rotatable input mechanism (e.g., scroll wheel)), a body gesture (e.g., a head, arm, hand, and/or finger gesture), and/or a voice input (e.g., "zoom in").

[0042] In response to receiving the first input, system **200** displays a magnified portion of CGR environment **204** from the first position. As illustrated in FIG. **2**B, magnified portion **204***b* is displayed in a circular region **206** on display **202** in the middle of the field of view and replaces part of unmagnified portion **204***a*. In some embodiments, region **206** is not circular and/or is not in the middle of the field of view. In some embodiments, the position of region **206** on display **202** is based on a gaze position (e.g., region **206** is centered on the position of a user's gaze). In some embodiments, a gaze position is determined based on data collected by sensors included in system **200**. In embodiments with more than one display (e.g., two displays, one for each eye), region **206** includes multiple sub-regions positioned on display **202**, which are perceived as a single region when viewed by a user. In some embodiments, system **200** displays a border of region **206** (e.g., a solid line around region **206**). In FIG. **2**B, the broken line represents the boundary of region **206** for the purpose of illustration, but is not actually displayed on display **202**.

[0043] Magnified portion **204***b* is displayed from the same position and orientation as unmagnified portion **204***a*, but is zoomed-in (displayed at a higher magnification or magnification level). In some embodiments, system **200** displays magnified portion **204***b* by continuously or incrementally zooming in to the magnification level displayed in FIG. **2**B.

[0044] In FIG. **2**B, a part of unmagnified portion **204***a* remains displayed, and is displayed simultaneously with magnified portion **204***b*. In the illustrated embodiment, the part of unmagnified portion **204***a* that is not replaced by magnified portion **204***b* surrounds magnified portion **204***b* and remains unchanged from FIG. **2**A (e.g., deer **208** is in the same position and has the same size, compared to FIG. **2**A).

[0045] While displaying unmagnified portion **204***a* and magnified portion **204***b*, system **200** receives a second input (e.g., an input similar to, but discrete from, the first input or a continuation of the first input). In response to the second input, system **200** displays another magnified portion of CGR environment **204** from the first position. As shown in FIG. **2**C, system **200** further magnifies the part of CGR environment **204** in the center of the field of view to display magnified portion **204***c*. In the illustrated embodiment, magnified portion **204***c* is displayed in region **204**, the size and position of which remains the same as in FIG. **2**B (e.g., magnified portion **204***c* replaces magnified portion **204***b*). Compared to magnified portion **204***b* in FIG. **2**B, magnified portion **204***c* has a larger magnification level and a smaller field of view. In some embodiments, the portion of CGR environment **204** displayed in region **206** of display **202** is continuously or incrementally zoomed to the magnification level of magnified portion **204***c*. Compared to FIG. **2**B, unmagnified portion **204***a* remains unchanged.

[0046] According to the features described above, a user can provide one or more inputs to obtain a magnified view of CGR environment **204** over a narrower field of view, while remaining at the first position (e.g., the same location within CGR environment **204**). This provides the user with a more detailed display of an area or object of interest (e.g., an area or object that the user may wish to approach), but without having to actually move in the CGR environment. This avoid unnecessary movement of the user in the CGR environment.

[0047] Furthermore, maintaining display of unmagnified portion **204***a* provides consistency and context to the user while displaying the magnified portion. For example, maintaining display of unmagnified portion **204***a* along with magnified portion **204***c* indicates to the user that the user has not moved in CGR environment **204**, but rather is simply being provided with a zoomed-in display of a portion of CGR environment **204** from the same position.

[0048] The response of system **200** to the inputs described above also allows a user to control the level of magnification in region **206**. In some embodiments, the amount or level of magnification is proportional to the magnitude of the input (s) (e.g., the amount of scrolling or length of a touch input or hand gesture). In some embodiments, system **200** decreases the magnification in region **206** or zooms out in response to input in a manner analogous to the techniques described above for increasing magnification. For example, system **200** can decrease magnification (e.g., transition from magnified portion **204***c* to magnified portion **204***b*) in response to an input that is opposite to the input for increasing magnification (e.g., scrolling or a hand or touch gesture in the opposite direction).

[0049] While displaying unmagnified portion **204***a* and magnified portion **204***c*, system **200** receives a third input. In some embodiments, the third input corresponds to a request to change (e.g., translate) the displayed field of view of CGR environment **204** or the orientation (e.g., without changing the position). In some embodiments, the third input is a movement (e.g., rotation or re-orientation) of system **200** or a portion thereof (e.g., as a result of a user turning his or her head while wearing an HMD). In response to receiving the third input, system **200** displays unmagnified portion **204***d* and magnified portion **204***e*, as shown in FIG. **2**D. In particular, as viewed in FIGS. **2**C-**2**D, system **200** rotates the orientation to the left. Unmagnified portion **204***d* and magnified portion **204***e* maintain the same positions on display **202** as unmagnified portion **204***a* and magnified portion **204***c*, respectively. Magnified portion **204***e* is displayed in region **206** and maintains the same magnification as magnified portion **204***c*.

[0050] FIGS. **2**C-**2**D illustrate the capability for a user to look around CGR environment **204** with a magnified display of at least a portion of CGR environment (e.g., as if looking through a telescope). The user can do so while remaining at the first position and also maintaining context provided by an unmagnified portion of CGR environment **204** (e.g., unmagnified portion **204***d*).

[0051] While displaying unmagnified portion **204***d* and magnified portion **204***e*, system **200** receives a fourth input corresponding to a request to display CGR environment **204** from a different position (e.g., change the position from which CGR environment **204** is displayed). In embodiments in which the position corresponds to a location in CGR environment **204**, the fourth input corresponds to a request to move to a new location in CGR environment **204** (e.g., the other side of pond **212** closer to deer **208**). In some embodiments, the fourth input is a button press (e.g., a press of an "OK" or "Enter" button), a tap on a touch sensitive display, or an audible input (e.g., "move"). In some embodiments, the fourth input is different than the first input, the second input, and the third input.

[0052] In response to receiving the fourth input, system **200** changes the position from which CGR environment is displayed. In some embodiments, in response to receiving the fourth input, system **200** displays CGR environment **204** from a position different than the first position. FIGS. **2**E-**2**F illustrate an exemplary embodiment of transitioning the display in region **206** from a magnified view from the first position (e.g., **204***e* in FIG. **2**D) to an unmagnified view from a new position (e.g., **204***g* in FIG. **2**F).

[0053] In FIG. **2**E, system **200** displays magnified portion **204***f* in region **206** (e.g., system **200** replaces magnified portion **204***e* with magnified portion **204***f*). Magnified portion **204***f* is from a second position in CGR environment **204** that is closer to deer **208** than the first position. In the embodiment illustrated in FIG. **2**E, unmagnified portion **204***d* is unchanged from FIG. **2**D. Continuing the transition, as shown in FIG. **2**F, system **200** displays another portion **204***g* of CGR environment **204** in region **206** from a third position that is even closer to deer **208** than the second position in FIG. **2**E (e.g., system **200** replaces magnified portion **204***f* with portion **204***g*). In some embodiments, the position changes smoothly from the first position to the third position by moving forward from the first position and orientation. For example, FIGS. **2**E and **2**F illustrate that in response to the fourth input, the position of CGR environment **204** displayed in region **206** is moved across pond **212** to a location closer to deer **208**. However, unmagnified portion **204***d* still remains unchanged in FIG. **2**F compared to FIGS. **2**D and **2**E.

[0054] In some embodiments, portion **204***g* is an unmagnified portion of CGR environment **204** from the third position. In such embodiments, system **200** transitions region **206** from a magnified view from the first position (e.g., **204***e*) to an unmagnified view from the new third position (e.g., **204***g*). Further, in the illustrated embodiment, system **200** changes the position from which CGR environment **204** is displayed within region **206**, while maintaining and concurrently displaying unmagnified portion **204***d* from the first position.

[0055] In some embodiments, in response to the fourth input corresponding to a request to display CGR environment **204** from a different position, system **200** determines a focus object in region **206** (e.g., the portion of CGR environment **204** displayed at the time the fourth input is received) and moves the position towards the focus object (e.g., along a straight line between the first position and the determined focus object). In the illustrated embodiment, system **200** determines deer **208** to be the focus object and moves the position towards deer **208**. In some embodiments, system **200** determines a point in CGR environment **204** (e.g., a point in the center of the field of view) and moves the position towards the determined point (e.g., if there is no particular object close to the center of the field of view at the time of the fourth input).

[0056] The embodiment illustrated in FIGS. **2**E-**2**F also illustrates an example of a dolly zoom technique. According to the dolly zoom technique, system **200** reduces the magnification and enlarges the field of view within region **206** as the position moves forward (e.g., translates) along the center of the field of view. In some embodiments, system **200** changes the magnification, field of view, and position simultaneously.

[0057] As discussed above, system **200** can determine a focus object within the magnified portion of CGR environment displayed in region **206** at the time the fourth input is received. In some embodiments, system **200** performs the dolly zoom such that the determined focus object remains displayed at the same size throughout the dolly zoom. In the illustrated embodiment, system **200** determines deer **208** to be the focus object and performs the dolly zoom such that the displayed size of deer **208** remains the same (e.g., system **200** zooms out the portion of CGR environment **204** displayed in region **206** as the position moves forward from the first position according to the orientation). The reduction in magnification is offset by moving closer to the focus object. For example, deer **208** is displayed at the same size in FIGS. **2**D, **2**E, and **2**F (magnified portions **204***e* and **204***f* and unmagnified portion **204***g*) by reducing the magnification within region **206** as the position gets closer to deer **208**.

[0058] As mentioned, in some embodiments, the dolly zoom technique also increases the field of view as the position moves. For example, the field of view displayed in region **206** is enlarged as the position is moved (e.g., to keep region **206** fully populated). In the transition from the first position to the second position illustrated by FIGS. **2**D-**2**E, the field of view is enlarged. The enlarged field of view is illustrated by the display of bush **214** and the sky above mountain **216** in region **206** in FIG. **2**E, as compared to FIG. **2**D. As the position continues to move from the second position to the third position (the transition from FIG. **2**E to FIG. **2**F), the field of view continues to enlarge, as indicated by more of bush **214** and more sky above mountain **216** being displayed in region **206** in FIG. **2**F, as compared to FIG. **2**E.

[0059] In some embodiments, system **200** determines the third position based on the magnification level of the magnified portion of CGR environment at the time system **200** receives the fourth input. For example, the third position (corresponding to unmagnified portion **204***g*) is determined based on the magnification level of magnified portion **204***e* in region **206** at the time the fourth input is received. In some embodiments, the change in position (e.g., the distance between the first position and the third position in CGR environment **204**) is directly proportional to the level of magnification (e.g., the more region **206** is zoomed in, the farther forward the position moves).

[0060] In some embodiments, system **200** determines the distance from an initial position (e.g., the first position) to a new position (e.g., the second or third position) based on the field of view FOV**0** of system **200** (e.g., the field of view of unmagnified portion **204***a*), a distance d**1** from the initial position to a focus object, a starting zoom factor m**1**, and a new zoom factor m**2**, where the zoom factors are values greater than zero and less than or equal to one. The field of view FOV**0** of the unmagnified portion of CGR environment **204** (e.g., the horizontal field of view of **204***a* or **204***d*) is multiplied by starting zoom factor m**1** to compute FOV**1**, which is the field of view that the magnified portion (e.g., **204***e*) would have if it were to occupy the entire display **202** (e.g., limiting the magnified portion to region **206** reduces the effective field of view of the magnified portion). A new field of view FOV**2** that is to be displayed at the new position is computed by multiplying the field of view FOV**0** of the unmagnified portion of CGR environment **204** (e.g., the field of view of **204***a* or **204***d*) times new zoom factor m**2**. The distance d**2** from the focus object to the new position is computed by dividing the tangent of one-half of FOV**1** (i.e., tan(0.5*FOV**1**)) by the tangent of one-half of FOV**2** (i.e.,

tan(0.5*FOV**2**)) and then multiplying the result (i.e., quotient) by distance d**1** from the initial position to the focus object. The distance from the initial position to the new position (e.g., the distance that a user moves in the CGR environment) is the difference between distance d**1** from the initial position to the focus object and distance d**2** from the new position to the focus object. This embodiment maintains the displayed size of the focus object (e.g., the displayed size of the focus object is the same in magnified portion **204***e*, **204***f*, **204***g*, **204***h*, and **204***i*). In some embodiments, m**1** is less than one (e.g., **204***e*) and m**2** is equal to 1 (e.g., **204***g*).

[0061] Turning to FIG. **2**G, system **200** expands region **206** to display portion **204***h* of CGR environment **204**. Portion **204***h* is an unmagnified portion of CGR environment **204** from the third position with a larger field of view than unmagnified portion **204***g*. In FIG. **2**G, region **206** expands radially outward from the center of the field of view and replaces part of unmagnified portion **204***d*. In some embodiments, system **200** expands region **206** after the dolly zoom is complete (e.g., system **200** expands region **206** after the position has reached the third position and is no longer changing; the position of the portion of CGR environment displayed in region **206** does not change as region **206** expands). In some embodiments, system **200** begins to expand region **206** automatically once the third position is reached (e.g., after the dolly zoom effect is complete in FIG. **2**F). In some embodiments, once the third position is reached, system **200** expands region **206** in response to another input (e.g., region **206** is not expanded until another input is received). In some embodiments, once the third position is reached, a user can look around CGR environment **204** (e.g., similar to FIGS. **2**C-**2**D) before expanding region **206** (e.g., by providing an input).

[0062] Turning to FIG. **2**H, system **200** continues to expand region **206** and displays a larger field of view of CGR environment **204** from the third position. In the illustrated embodiment, system **200** expands region **206** until an unmagnified portion **204***i* from the third position completely replaces unmagnified portion **204***d* from the first position (e.g., system **200** replaces unmagnified portion **204***d* with unmagnified portion **204***i* from the third position). In FIG. **2**H, the display of CGR environment **200** on display **202** is entirely from the third position.

[0063] In some embodiments, displaying unmagnified portion **204***i* in FIG. **2**H completes movement in CGR environment **204** from the first position to the third position. Once display **202** is completely occupied by unmagnified portion **204***i*, system **200** can display magnified portions of CGR environment **204** from the third position, change the orientation while staying at the third position, and/or move from the third position to another position according to the techniques described above with reference to FIGS. **2**A-**2**H (e.g., unmagnified portion **204***i* and the state of system **200** in FIG. **2**H is analogous to unmagnified portion **204***a* and the state of system **200** illustrated in FIG. **2**A).

[0064] The techniques described above allow a user to move about CGR environment **204**, and further, to control where to move within CGR environment **204**. For example, a user can zoom-in to preview a portion of CGR environment **204** with more detail. If, for example, the user is not interested in the magnified portion, the user can change the orientation to preview magnified portions of CGR environment **204** in other directions. In addition to selecting a particular orientation, the user can adjust the magnification in region **206** by zooming in or out to set how far to move in the current direction. For example, a user can zoom in to move farther (e.g., closer to an object of interest) or zoom out to travel less distance (e.g., remain closer to the current location). A user can estimate roughly how far the position will move knowing that the position will move to a location at which objects in the magnified portion in region **206** will appear approximately the same size without magnification at the new position.

[0065] Turning now to FIG. **3**, a flow chart of exemplary process **300** for moving about a CGR environment is depicted. Process **300** can be performed using a device (e.g., **100***a* or **200**). The device is, for example, a handheld mobile device, a head-mounted device, or a head-up device. In some embodiments, process **300** is performed using two or more electronic devices, such as a device that is communicatively coupled to another device, such as a base device. In these embodiments, the operations of process **300** are distributed in any manner between the two or more devices. In some embodiments, the device causes one or more of the steps in process **300** to be performed instead of, or in addition to, performing the step itself (e.g., the device causes a remote device to display various features of process **300**, such as by sending instructions to the remote device). Further, the display of the device can be transparent or opaque. Process **300** can be applied to CGR applications, including virtual reality and mixed reality applications. Although the blocks of process **300** are depicted in a particular order in FIG. **3**, these blocks can be performed in other orders. Further, one or more blocks of process **300** can be partially performed, optionally performed, omitted, and/or combined with another block(s). Additional blocks can also be performed.

[0066] At block **302**, the device displays a magnified portion (e.g., **204***b*, **204***c*, or **204***e*) of the CGR environment (e.g., **204**) from a first position and an unmagnified portion (e.g., **204***a* or **204***d*) of the CGR environment from the first position (e.g., the position of portions **204***a*-**204***e*). In some embodiments, the device displays the magnified portion of the CGR environment in response to receiving an input (e.g., a scroll input; see, e.g., the transition from FIG. **2**A to FIG. **2**B or FIG. **2**C). In some embodiments, the magnified portion of the CGR environment from the first position is displayed concurrently with the unmagnified portion of the CGR environment from the first position (see, e.g., FIGS. **2**B-**2**D). For example, the magnified portion is displayed in the center of the field of view and is surrounded by the unmagnified portion (see, e.g., FIGS. **2**B-**2**D).

[0067] In some embodiments, the magnified portion of the CGR environment from the first position is a first magnified portion of the CGR environment from the first position, and the unmagnified portion of the CGR environment from the first position is a first unmagnified portion of the CGR environment from the first position (see, e.g., FIG. **2**D). In accordance with some such embodiments, before displaying the first magnified portion (e.g., **204***e*) of the CGR environment from the first position and before displaying the first unmagnified portion (e.g., **204***d*) of the CGR environment from the first position, the device displays a second magnified portion (e.g., **204***c*) of the CGR environment from the first position that is different than the first magnified portion (e.g., **204***e*) of the CGR environment from the first position and displays, concurrently with the second magnified portion (e.g., **204***c*) of the CGR environment from the first position, a second unmagnified portion (e.g., **204***a*) of the

CGR environment from the first position that is different than the first unmagnified portion (e.g., **204***d*) of the CGR environment from the first position. For example, the device can display a magnified portion of the CGR environment along a first orientation from the first position (e.g., FIG. **2**C) and then (e.g., in response to receiving an input) move to an orientation corresponding to the first magnified portion of the CGR environment (see, e.g., FIG. **2**D).

[0068] At block **304**, the device receives an input. At block **306**, the device displays (e.g., in response to receiving the input) a magnified portion (e.g., **204***f*) of the CGR environment from a second position (e.g., the position of portion **204***f*). In some embodiments, the magnified portion (e.g., **204***f*) from the second position replaces the magnified portion (e.g., **204***e*) from the first position by translating from the first position to the second position (see, e.g., the transition from FIG. **2**D to FIG. **2**E). In some embodiments, the magnified portion (e.g., **204***f*) of the CGR environment from the second position has a magnification less than a magnification of the magnified portion (e.g., **204***e*) of the CGR environment from the first position. For example, the device zooms out as the position moves forward. In some embodiments, the magnified portion (e.g., **204***f*) of the CGR environment from the second position has a field of view greater than a field of view of the magnified portion (e.g., **204***e*) of the CGR environment from the first position. For example, the device expands the field of view as the position moves forward.

[0069] At block **308**, the device displays a first unmagnified portion (e.g., **204***g*) of the CGR environment from a third position (e.g., the position of portions **204***g*-**204***i*). In some embodiments, the first unmagnified portion (e.g., **204***g*) of the CGR environment from the third position has a field of view greater than the field of view of the magnified portion (e.g., **204***f*) of the CGR environment from the second position. In some embodiments, the third position is based on the magnification of the magnified portion (e.g., **204***c* or **204***e*) of the CGR environment from the first position. For example, the distance in the CGR environment from the first position to the third position is directly proportional to the magnification when the input is received (e.g., the greater the magnification, the further the position is moved). In some embodiments, the currently displayed position is translated from the first position to the third position through the second position. For example, the position translates forward in the CGR environment while the field of view is expanded and the magnification is reduced (e.g., the device simultaneously translates the position, expands the field of view, and reduces the magnification). In some embodiments, the unmagnified portion (e.g., **204***d*) of the CGR environment from the first position is displayed concurrently with the first unmagnified portion (e.g., **204***g*) of the CGR environment from the third position (see, e.g., FIG. **2**F).

[0070] In some embodiments, the device determines the third position based on an orientation corresponding to the magnified portion of the CGR environment from the first position. In some embodiments, the third position is in the center of the magnified portion (e.g., the center of region **206**).

[0071] In some embodiments, the device determines (e.g., in response to receiving the input in block **304**) a focus object (e.g., object **208**) within the magnified portion of the CGR environment from the first position and determines the third position based on the determined focus object. For example, the device determines a focus object, such as the object nearest the center of the field of view or an object at a gaze position (which might be different than the center of the field of view, e.g., if a user is not looking at the center of display **202**)), and then moves the position directly toward the focus object. In some embodiments, the device maintains the displayed size of the focus object (e.g., object **208** stays the same size in FIGS. **2**D-**2**H). For example, the device displays the focus object at the same size in the magnified portion of the CGR environment from the first position, the unmagnified portion of the CGR environment from the second position, and the unmagnified portion of the CGR environment from the third position.

[0072] At block **310** (e.g., after displaying the first unmagnified portion of the CGR environment from the third position), the device displays a second unmagnified portion (e.g., **204***h* or **204***i*) of the CGR environment from the third position. In some embodiments, the second unmagnified portion of the CGR environment from the third position has a field of view greater than the field of view of the first unmagnified portion (e.g., **204***g*) of the CGR environment from the third position. For example, the device expands the field of view of the unmagnified portion of the CGR environment from the third position (e.g., by enlarging region **206**) to replace the unmagnified portion (e.g., **204***a* or **204***d*) from the first position. In some embodiments, the device replaces the unmagnified portion of the CGR environment from the first position (e.g., a portion of the CGR environment displayed along the outer portion of display **202**) with the second unmagnified portion of the CGR environment from the third position.

[0073] Executable instructions for performing the features of method **300** described above are, optionally, included in a transitory or non-transitory computer-readable storage medium (e.g., memory(ies) **106**) or other computer program product configured for execution by one or more processors (e.g., processor(s) **102**).

What is claimed is:

1. An electronic device, comprising:

one or more processors; and

memory storing one or more programs configured to be executed by the one or more processors, the one or more programs including instructions for:

displaying a magnified portion of a computer-generated reality (CGR) environment from a first position and an unmagnified portion of the CGR environment from the first position;

receiving an input; and

in response to receiving the input:

displaying a magnified portion of the CGR environment from a second position, wherein the magnified portion of the CGR environment from the second position has a magnification less than a magnification of the magnified portion of the CGR environment from the first position, and wherein the magnified portion of the CGR environment from the second position has a field of view greater than a field of view of the magnified portion of the CGR environment from the first position;

displaying a first unmagnified portion of the CGR environment from a third position, wherein the first unmagnified portion of the CGR environment from the third position has a field of view greater than the

field of view of the magnified portion of the CGR environment from the second position; and

after displaying the first unmagnified portion of the CGR environment from the third position, displaying a second unmagnified portion of the CGR environment from the third position, the second unmagnified portion of the CGR environment from the third position having a field of view greater than the field of view of the first unmagnified portion of the CGR environment from the third position.

2. The electronic device of claim **1**, the one or more programs further including instructions for:

before displaying the magnified portion of the CGR environment from the first position, receiving a second input; and

in response to receiving the second input, displaying the magnified portion of the CGR environment.

3. The electronic device of claim **1**, wherein displaying the second unmagnified portion of the CGR environment from the third position includes replacing the unmagnified portion of the CGR environment from the first position with the second unmagnified portion of the CGR environment from the third position.

4. The electronic device of claim **1**, wherein the third position is based on the magnification of the magnified portion of the CGR environment from the first position.

5. The electronic device of claim **1**, wherein the magnified portion of the CGR environment from the first position is displayed concurrently with the unmagnified portion of the CGR environment from the first position.

6. The electronic device of claim **1**, wherein displaying the first unmagnified portion of the CGR environment from the third position includes translating a currently displayed position from the first position to the third position through the second position.

7. The electronic device of claim **1**, wherein the unmagnified portion of the CGR environment from the first position is displayed concurrently with the first unmagnified portion of the CGR environment from the third position.

8. The electronic device of claim **1**, wherein:

the magnified portion of the CGR environment from the first position is a first magnified portion of the CGR environment from the first position, and

the unmagnified portion of the CGR environment from the first position is a first unmagnified portion of the CGR environment from the first position,

the one or more programs further including instructions for:

before displaying the first magnified portion of the CGR environment from the first position and before displaying the first unmagnified portion of the CGR environment from the first position:

displaying a second magnified portion of the CGR environment from the first position that is different than the first magnified portion of the CGR environment from the first position; and

displaying, concurrently with the second magnified portion of the CGR environment from the first position, a second unmagnified portion of the CGR environment from the first position that is different than the first unmagnified portion of the CGR environment from the first position.

9. The electronic device of claim **1**, the one or more programs further including instructions for:

determining the third position based on an orientation corresponding to the magnified portion of the CGR environment from the first position.

10. The electronic device of claim **1**, the one or more programs further including instructions for:

determining a focus object within the magnified portion of the CGR environment from the first position; and

determining the third position based on the focus object.

11. The electronic device of claim **10**, wherein:

the focus object is displayed at a first size in the magnified portion of the CGR environment from the first position;

the focus object is displayed at the first size in the unmagnified portion of the CGR environment from the second position; and

the focus object is displayed at the first size in the unmagnified portion of the CGR environment from the third position.

12. A non-transitory computer-readable storage medium storing one or more programs configured to be executed by one or more processors of an electronic device, the one or more programs including instructions for:

displaying a magnified portion of a computer-generated reality (CGR) environment from a first position and an unmagnified portion of the CGR environment from the first position;

receiving an input; and

in response to receiving the input:

displaying a magnified portion of the CGR environment from a second position, wherein the magnified portion of the CGR environment from the second position has a magnification less than a magnification of the magnified portion of the CGR environment from the first position, and wherein the magnified portion of the CGR environment from the second position has a field of view greater than a field of view of the magnified portion of the CGR environment from the first position;

displaying a first unmagnified portion of the CGR environment from a third position, wherein the first unmagnified portion of the CGR environment from the third position has a field of view greater than the field of view of the magnified portion of the CGR environment from the second position; and

after displaying the first unmagnified portion of the CGR environment from the third position, displaying a second unmagnified portion of the CGR environment from the third position, the second unmagnified portion of the CGR environment from the third position having a field of view greater than the field of view of the first unmagnified portion of the CGR environment from the third position.

13. The non-transitory computer-readable storage medium of claim **12**, the one or more programs further including instructions for:

before displaying the magnified portion of the CGR environment from the first position, receiving a second input; and

in response to receiving the second input, displaying the magnified portion of the CGR environment.

14. The non-transitory computer-readable storage medium of claim **12**, wherein displaying the second unmagnified portion of the CGR environment from the third position includes replacing the unmagnified portion of the

CGR environment from the first position with the second unmagnified portion of the CGR environment from the third position.

15. The non-transitory computer-readable storage medium of claim **12**, wherein the third position is based on the magnification of the magnified portion of the CGR environment from the first position.

16. The non-transitory computer-readable storage medium of claim **12**, wherein the magnified portion of the CGR environment from the first position is displayed concurrently with the unmagnified portion of the CGR environment from the first position.

17. The non-transitory computer-readable storage medium of claim **12**, wherein displaying the first unmagnified portion of the CGR environment from the third position includes translating a currently displayed position from the first position to the third position through the second position.

18. The non-transitory computer-readable storage medium of claim **12**, wherein the unmagnified portion of the CGR environment from the first position is displayed concurrently with the first unmagnified portion of the CGR environment from the third position.

19. The non-transitory computer-readable storage medium of claim **12**, wherein:

the magnified portion of the CGR environment from the first position is a first magnified portion of the CGR environment from the first position, and

the unmagnified portion of the CGR environment from the first position is a first unmagnified portion of the CGR environment from the first position,

the one or more programs further including instructions for:

before displaying the first magnified portion of the CGR environment from the first position and before displaying the first unmagnified portion of the CGR environment from the first position:

displaying a second magnified portion of the CGR environment from the first position that is different than the first magnified portion of the CGR environment from the first position; and

displaying, concurrently with the second magnified portion of the CGR environment from the first position, a second unmagnified portion of the CGR environment from the first position that is different than the first unmagnified portion of the CGR environment from the first position.

20. A method for moving about a computer-generated reality (CGR) environment, comprising:

displaying a magnified portion of the CGR environment from a first position and an unmagnified portion of the CGR environment from the first position;

receiving an input; and

in response to receiving the input:

displaying a magnified portion of the CGR environment from a second position, wherein the magnified portion of the CGR environment from the second position has a magnification less than a magnification of the magnified portion of the CGR environment from the first position, and wherein the magnified portion of the CGR environment from the second position has a field of view greater than a field of view of the magnified portion of the CGR environment from the first position;

displaying a first unmagnified portion of the CGR environment from a third position, wherein the first unmagnified portion of the CGR environment from the third position has a field of view greater than the field of view of the magnified portion of the CGR environment from the second position; and

after displaying the first unmagnified portion of the CGR environment from the third position, displaying a second unmagnified portion of the CGR environment from the third position, the second unmagnified portion of the CGR environment from the third position having a field of view greater than the field of view of the first unmagnified portion of the CGR environment from the third position.

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